

QUARTERLY REPORT

Investigate Fundamentals and Performance Improvements of Current In-Line Inspection Technologies for Mechanical Damage Detection

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Technical Status

The research continues into Phase II; the testing in this phase is intended to provide additional understanding of the capabilities for six (6) current mechanical damage technologies improving on the quantity and quality of data provided during the Phase I study. Phase I primarily used data from in-line inspection vendors, and the research concluded that the available validation data provided limited understanding of the capability of the technologies with regard to dents with metal loss (DML) or with cracks. The limitations were due to small validation sample sizes, and incomplete and insufficient validation measurement data, as detailed below:

Limitations related to historical data:

- Small data sets with respect to DML
- Operator data may not have been “current technology”
- Method of validation often not recorded
 - Error or bias suspected but could not be quantified
- Dent lengths and widths not recorded
 - Generally only the maximum dent depth (Dmax) is available
- Coincident metal loss features
 - Location within dents not recorded
 - Depth, length, orientation not recorded
 - Use of MT to inspect for cracks often not recorded

The detailed scope for Phase II focuses on improved data input from participating pipeline operators as detailed below:

- Obtain validation performance baseline
 - Identify the current in-ditch inspection protocols; bridge bar, pit gauges, laser
 - Document performance baseline
 - Not necessarily to require the most accurate validation protocol but to at least know what was employed and have an idea of its performance
- Obtain current operator dig data
 - Recent reliable dig data or new digs using consistent data protocol to ensure
 - We know the validation method and its errors
 - Dents depth/length/width recorded
 - Metal loss protocol; at least: discrimination, grind depth, length, orientation, position and crack inspection results
 - Operating pressure at time of measurement
 - Use historical data if adequate quality
 - Target population of 150 Mechanical Damage (MD) features desired
- Data Gathering Status
 - Data submitted for 274 mechanical damage features
 - 2 Liquid Pipeline Operators (PRCI member companies) participating
 - 4 Gas Pipeline Operators (PRCI member companies) participating
 - Data required for one remaining technology (Technology H and C; MFL + Caliper, PRCI assisting with call to membership for ILI mechanical damage data for this particular technology)

MD Data Gathering Status

Technology		Capability	MD Features Collected
K	Caliper	Dent	95
L	Caliper + MFL	DML	29
E	Triaxial MFL	Dent+DML	15
G	Caliper	Dent	Committed
J	Caliper + MFL Combo	Dent+DML	135
H	Caliper + MFL	Dent+DML	N/A

Table 1. Phase II Mechanical Damage Data Collection Status

- Wrap up data gathering in late spring/early summer 2009

The field data will be compared against the predictions made by the 6 technologies identified in Phase I to compare capability to detect and discriminate mechanical damage.

Results and Conclusions

An improved database of ILI Mechanical Damage predictions and direct assessment validations continues to be compiled and is being analyzed for correlations and performance measurements. Compilation consists of extracting data from inspection reports and operator supplied spreadsheets.

The improved data (as compared with Phase I data) have allowed for analysis of data based on the following data filters:

- Validation measurement protocol employed and inspection run identification allowing for consistent data comparisons
- Clock orientation, top of pipe versus bottom of pipe
 - This is important for application of correction factors for pressure-rounding upon excavation of constrained dents.
- Discrimination of gouge versus corrosion versus cracks in validation excavations which is an important consideration for probability of identification performance measures for dents with metal loss

Examples of improvements in the understanding of capabilities for technologies completed thus far are illustrated in Figure 1 and Table 2 below.

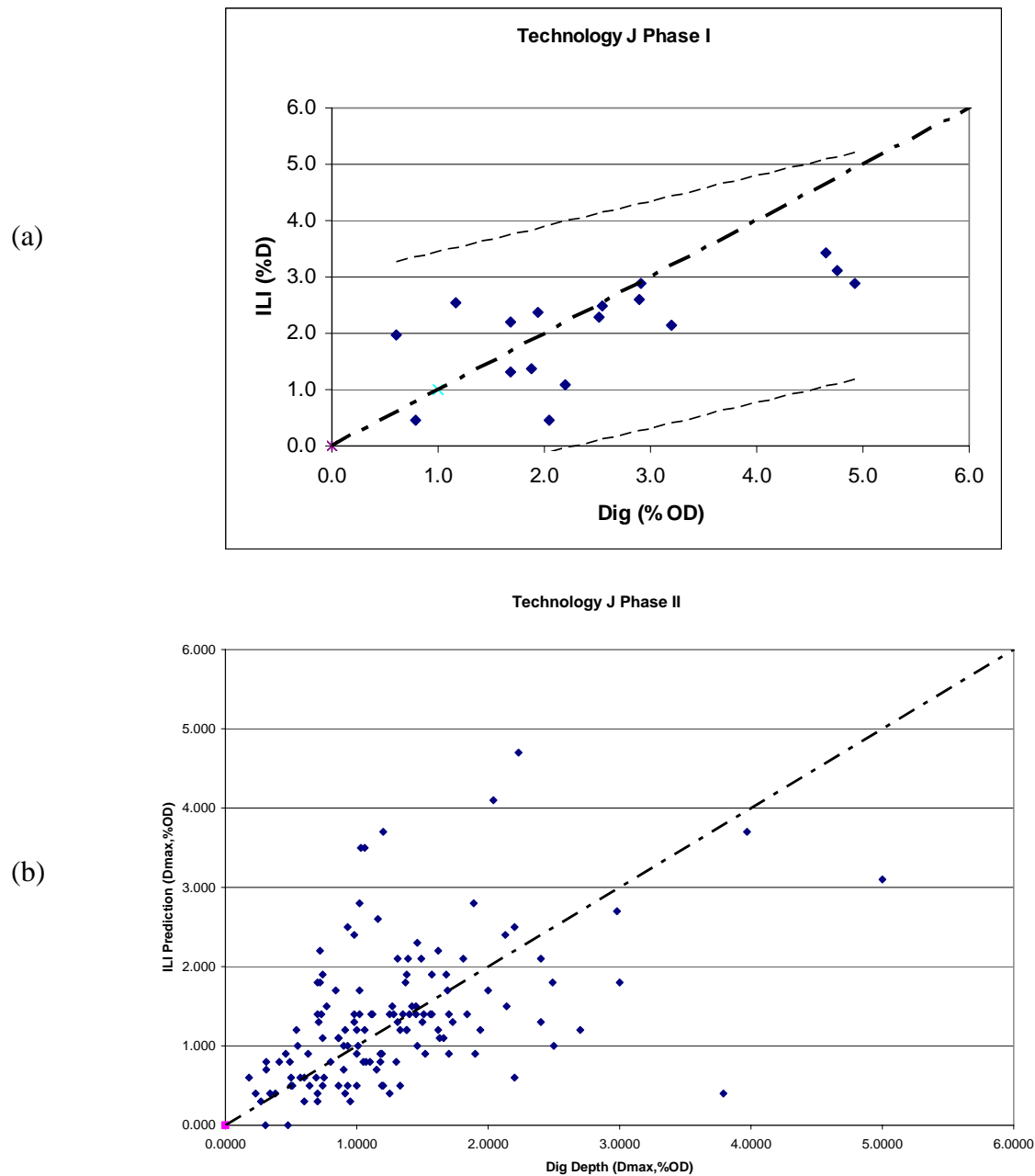


Figure 1. Comparisons of dent depth data (Dmax) predictions and in-ditch validation measurements (Phase I data (a) and Phase II data (b)) where significantly bigger data set was available for analysis

		Technology	Dent	Dent with Metal Loss (DML)		
			Depth Tol	POD (LL)	POFC(UL)	POI(LL)
MD1-2 Phase I	Unknown mixed protocols small (n)	Caliper+ MFL	+2.37%	64%	65%	68%
MD1-2 Phase II	Consistent Protocol, Recent Assessments, More Feature Data	Caliper+ MFL	+1.5%	90%	24%	90%

Table 2. Comparisons of performance measures using Phase I and Phase II data

The data evaluated to date is achieving the objectives identified in the Phase I report, namely providing increased data sets and assessment attribute data allowing for more statistically sound performance measures for comparisons of capability.

Issues, Problems or Challenges

Data response from pipeline operators and timing for validation excavations is a significant schedule challenge and is being actively managed. Direct solicitation of PRCI membership is proving to be successful in identifying and delivering data. Substantial coordination with the participating pipeline operators and their contractors will be required for the field verification activities.

PRCI continues to evaluate the timing for completing the Phase II work relative to the current project schedule. Modifications to the milestone schedule and the OTA for the project will be required, as the Phase II report will not be prepared and submitted before April 30, 2009, which is the current expiration date for the contract.

Plans for Future Activity

The results of the Phase I report and any work completed for the Phase II portion of the project will be presented at PRCI's Research Exchange Meeting, scheduled for February 3-5, 2009, in Atlanta, GA. In addition, a technical paper will be prepared and the project results will be presented at the APIA-EPRG-PRCI Joint Technical Meeting, scheduled for May 11-15, 2009 in Milan, Italy.

A contract modification request will be submitted to PHMSA during the next quarterly period to extend the OTA as necessary to complete the Phase II study.